

# Option Value Analysis of Flexibility in Supply Chain Postponement

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# Overview

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- ◆ Idea of Postponement
- ◆ Design of Postponement: Printers
- ◆ Facts
- ◆ Decision Analysis Scenarios
- ◆ Decision Tree Analysis
- ◆ Lattice Analysis Scenarios
- ◆ Lattice Valuation
- ◆ Conclusion

# Idea of Postponement

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- ◆ Delay the final configuration of merchandise in a supply chain
- ◆ Value propositions:
  - Adaptability to uncertain demand in market
  - Minimize inventory & depreciation costs
- ◆ Printer Body & Transformers
  - Valuation of assembling transformers at point of sale

# Design of Postponement: Printers

## ◆ Current State:

- 100 printers produced total in US
- Body & Transformers produced & assembled at factory
- 50 provided to US market
- 50 to EU market

## ◆ Future States Possible:

- Bodies produced at factory, transformers assembled at point of sale
- Flexible shipment strategy to US and EU markets based on demand pattern
  - ◆ 50/50, 60/40, 40/60 US/EU shipment ratio

# Facts

## ◆ Printers

- Price: \$100 per unit
- Costs per unit:
  - ◆ Material & operating - \$82
  - ◆ Shipping - \$5 (to EU only)
  - ◆ Storage - \$2 (transformer only)

## ◆ Demand

- EU: Constant
- US: Fluctuate

## ◆ Two alternatives

	Market	Printer Module	Transformer (US)	Transformer (EU)
Alternative 1	US	50	50	
	EU	50		50
Alternative 2	All	100	60	60

# Decision Analysis Scenarios

## ◆ Assume:

- 20% demand high in US
- 60% demand even across markets
- 20% demand low in US

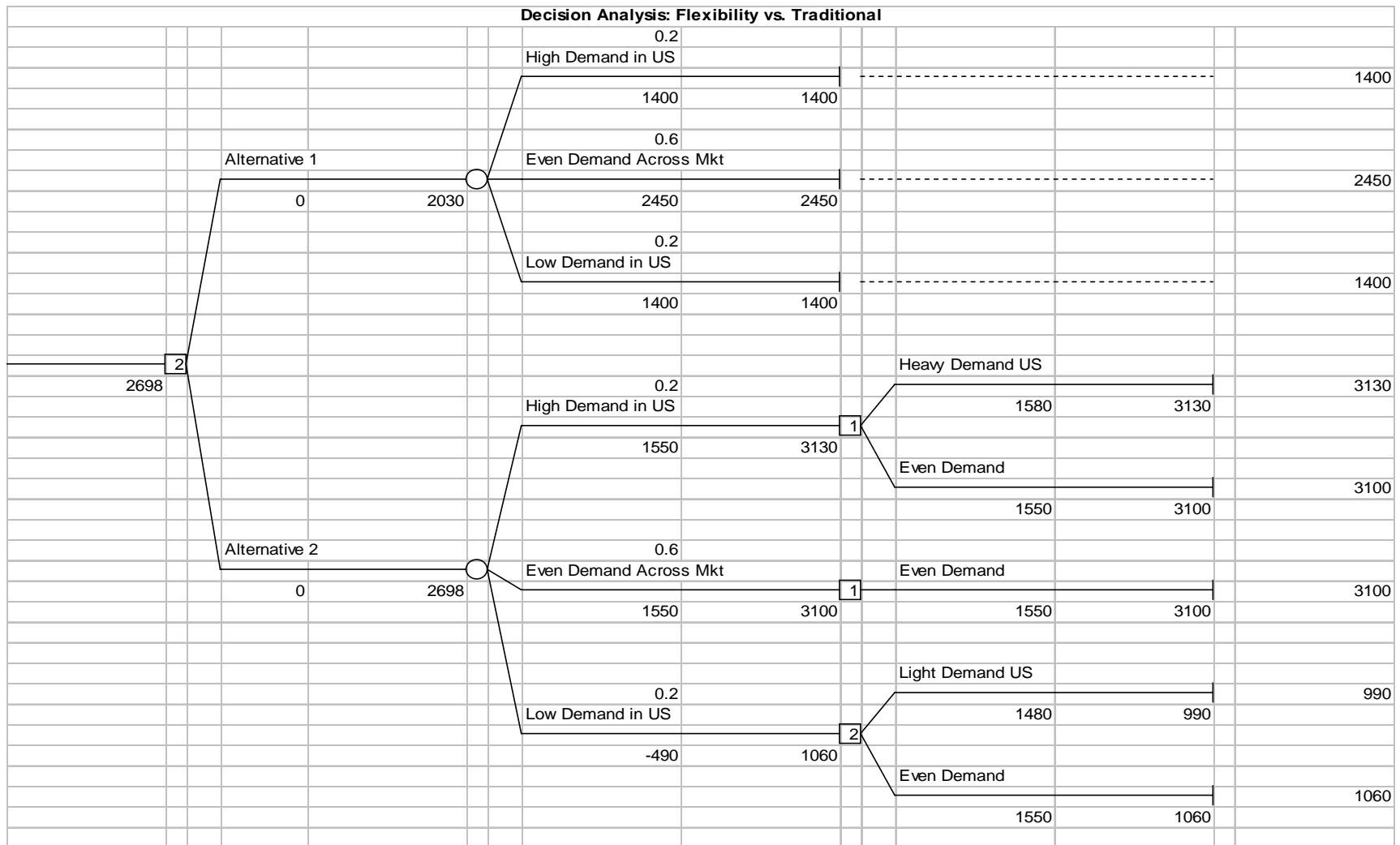
## ◆ Scenarios

- Stage 1:
  - ◆ No flexibility of exercising option
  - ◆ Alternative 1 – Expected Value: \$2030
- Stage 2:
  - ◆ Exercise option of flexibility for alternative 2 in respond to market signal
  - ◆ Alternative 2 – Expected Value: \$2,698

## ◆ Analysis

- Flexibility alter shipment ratio based on demand
- Align supply with demand to yield maximum profit

# Decision Tree Analysis



# Lattice Analysis Scenarios

## ◆ Market

- US: demand rate of increase: 0.1%/year
- Standard deviation of demand: 10%
- Switching Cost: \$3000
- Discount Rate: 12%

## ◆ Demand Pattern & Probability

US/EU Demand Ratio LATTICE						PROBABILITY LATTICE					
Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
1.00	1.11	1.22	1.35	1.49	1.65	1.00	0.51	0.26	0.13	0.07	0.03
	0.90	1.00	1.11	1.22	1.35		0.49	0.50	0.38	0.25	0.16
		0.82	0.90	1.00	1.11			0.25	0.37	0.37	0.32
			0.74	0.82	0.90				0.12	0.25	0.31
				0.67	0.74					0.06	0.15
					0.61						0.03

# Lattice Valuation

NPV (50/50)				
Year 0	Year 1	Year 2	Year 3	Year 4
\$1,344.92	(\$944.83)	(\$587.01)	(\$370.99)	(\$214.40)
	(\$984.09)	\$489.06	(\$854.67)	(\$663.21)
		(\$605.03)	(\$887.74)	\$171.30
			(\$380.60)	(\$686.23)
				(\$215.12)

NPV (60/40)				
Year 0	Year 1	Year 2	Year 3	Year 4
\$1,593.09	\$880.22	\$568.47	\$412.79	\$238.56
	(\$786.98)	\$807.31	\$759.37	\$737.93
		(\$503.41)	(\$674.31)	\$614.87
			(\$370.59)	(\$668.17)
				(\$209.46)

NPV (40/60)				
Year 0	Year 1	Year 2	Year 3	Year 4
\$1,478.41	(\$707.25)	(\$506.90)	(\$370.99)	(\$214.40)
	\$796.22	\$738.51	(\$673.41)	(\$663.21)
		\$508.04	\$684.57	\$555.17
			\$370.59	\$668.17
				\$209.46

# Lattice Valuation (Cont.)

## ◆ Option of Flexibility - Not Exercised

- NPV: \$1,344.92 (Year 0)
- Result: Profitable initially but result in debt thereafter

## ◆ Exercise Option of Flexibility

- 60/40 Shipment Ratio
  - ◆ NPV: \$1,593.09 (Year 0)
- 40/60 Shipment Ratio
  - ◆ NPV: \$1,478.41 (Year 0)
- Results
  - ◆ Higher Initial Profit
  - ◆ Profit continue to be positive due to option to adopt shipment to demand pattern

# Conclusion

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- ◆ Higher ROI with flexibility option
  - Mixture of flexibility offer greatest return despite high switching cost
- ◆ Theory compare against reality
  - Reasonable assumptions
    - ◆ High switching cost mirrors costly effort to alter scheduled operation in reality
  - Scenario near reality
    - ◆ EU market should be fluctuating to make analysis closer to reality
    - ◆ Simulations of probability of demand in US market to provide more observations to values of option
- ◆ Valuations could be applied elsewhere
  - Customizable computer systems

# Questions?

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